Assessing the real world performance of autogas cars

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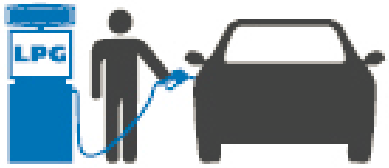
What is autogas

- LPG used as on-road engine fuel
- Propane, butane or a propane/butane mix
- The most commonly used alternative fuel in Europe: 45,000+ filling stations, 13.7 million+ vehicles (in EU+6, 2014)
- An environmentally friendly option for road transport



Safe, convenient, available, growing and clean

Our approach

Bring evidence on autogas fueled vehicles performance in terms of CO2 and pollutant emissions

- Based on state-of-the-art RDE test procedures, to become mandatory in the EU in September 2017
- Overcome the limits of test labs by reproducing real driving conditions
- Make it possible to compare the environmental performance of autogas and gasoline fueled vehicles (similar tests on diesel vehicles upcoming)
- Measure simultaneously a number of GHG and pollutants: CO2, CO, NOx, HC, particle number

Methodology (1)

- Tests run by V-Motech on behalf of the French LPG association (CFBP) and the European LPG Association (AEGPL)
- 2 vehicles tested:
  - Alfa Romeo Mito: Euro 5 homologated; LPG system retrofitted; mileage of 65,000 km
  - Fiat 500L: Euro 6 homologated; original LPG vehicle from manufacturer; mileage of 6,300 km
- Series of 3 tests for each type of fuel (LPG, gasoline) and car
- All tests done at comparable speed, weather and altitude conditions

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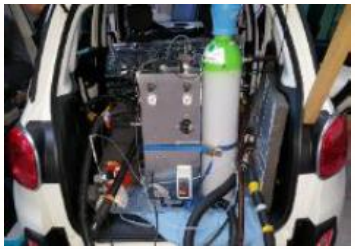
Methodology (2)

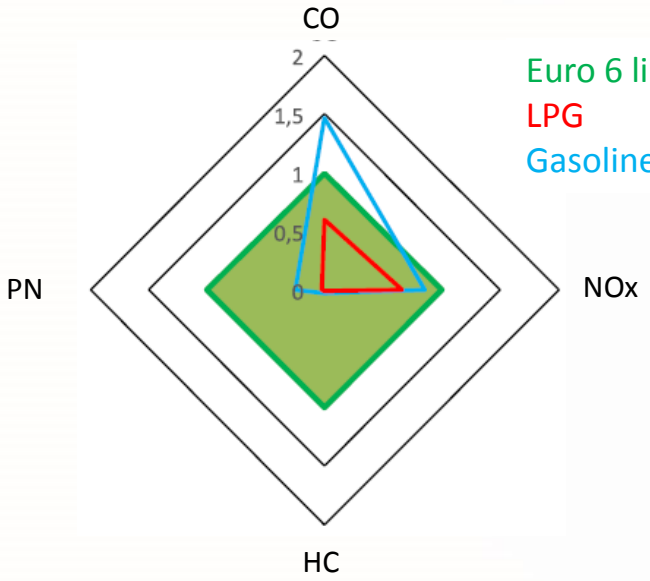
- Emission data collected by to a Portable Emission Measurement System (PEMS) fitted on the cars
- Tests run in compliance with recently adopted EU Real Driving Emission (RDE) Regulation
- Following a specific route with urban, rural and motorway segments



Trip Requirements		Urban	Rural	Motorway	Total
Velocity Thresholds	km/h	[1-60[	[60-90[	[90- ...	
ave Velocity ECU	km/h	29.1	79.0	113.6	54.7
share <= 1km/h; minutes >= 100 km/h		15.1 %		13.2 min	
Trip Share ECU Distance	%	32.4	31.4	36.2	
Distance ECU	km	27.62	26.83	30.90	86.89
Duration	min	57	20	16	93
Fuel Consumption	l	****	****	****	****
Fuel Consumption Carbon Balance	l	3.071	2.207	2.922	8.839
Fuel Economy	l/km100	****	****	****	****
Fuel Economy Carbon Balance	l/km100	11.12	8.23	9.45	10.83

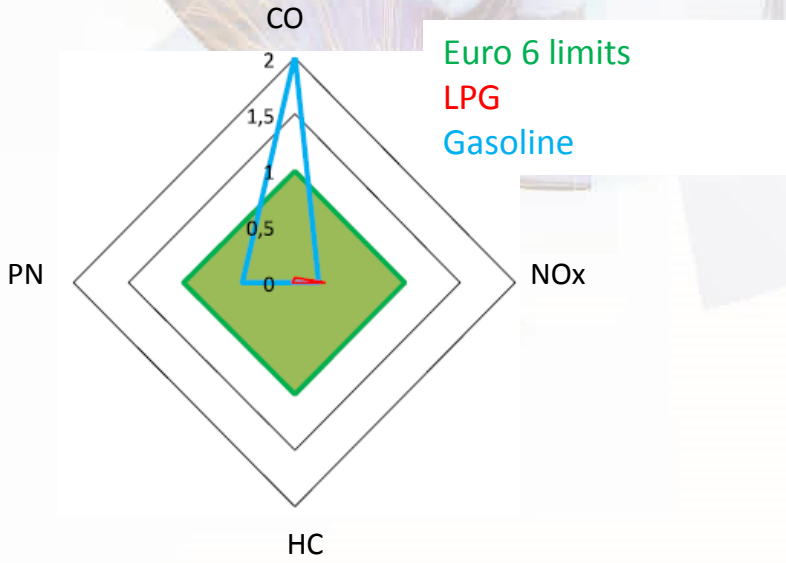
Results overview

Mito



Contrary to gasoline, emissions from an older Euro 5 LPG vehicle are well below Euro 6 limits for all pollutants

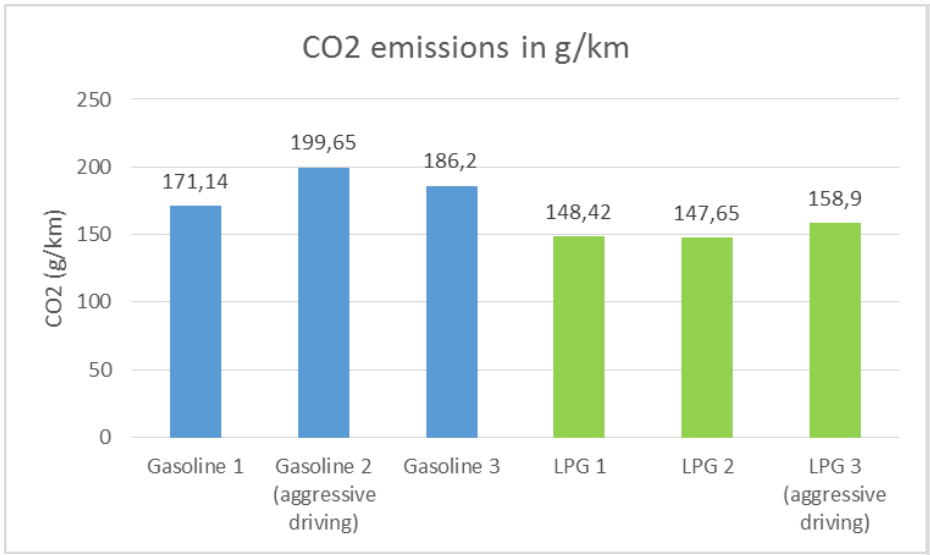
Fiat 500L



Contrary to gasoline, emissions from a recent Euro 6 LPG vehicle are negligible for all pollutants

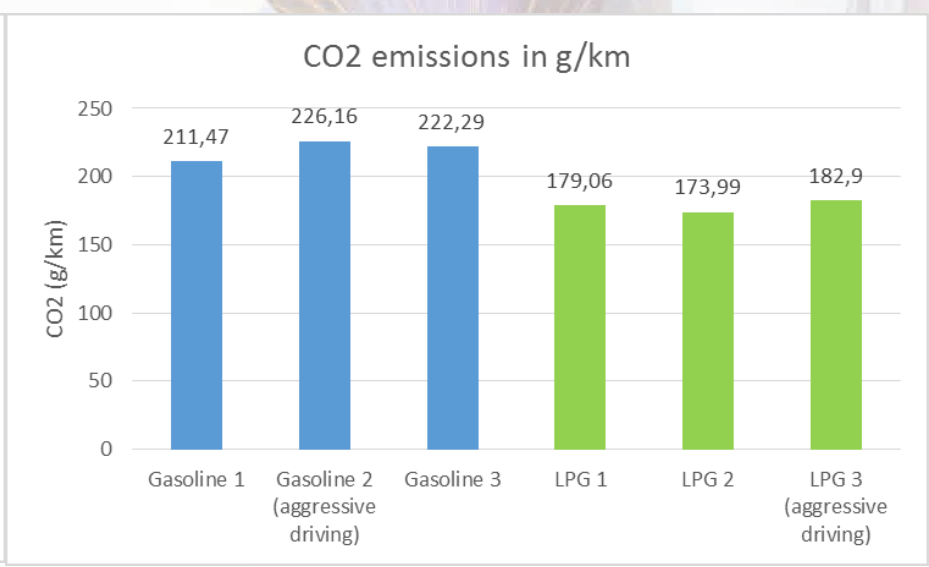
CO2 emissions results

Mito



The LPG car emits in average 17% less CO2 than the model running on gasoline

Fiat 500L



The LPG car emits in average 19% less CO2 than the model running on gasoline

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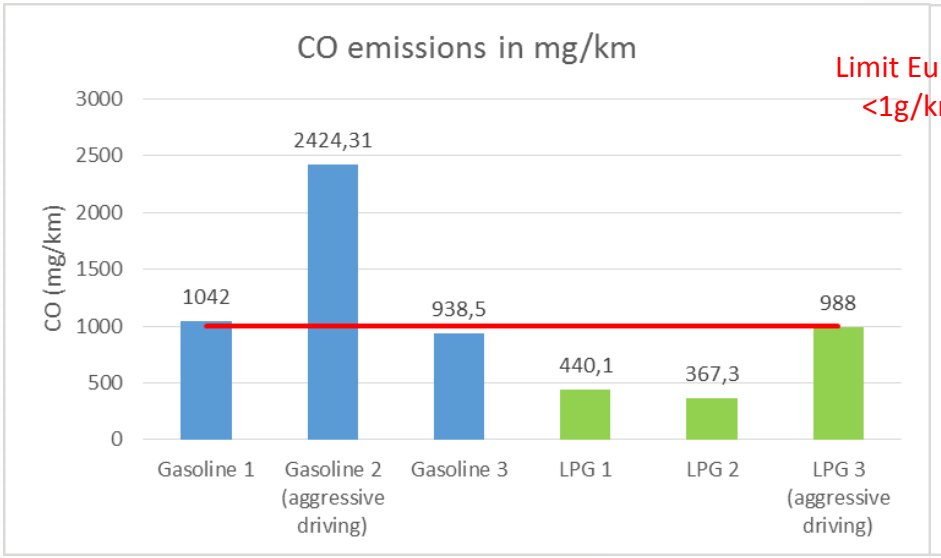
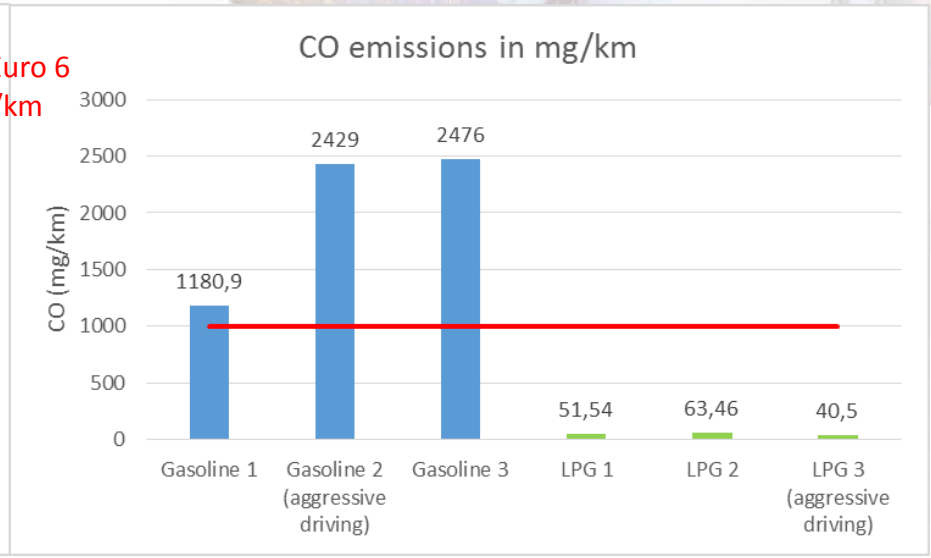
Carbon monoxide (CO) emissions results

Mito



Limit Euro 6
<1g/km

Fiat 500L



The LPG car emits in average 59% less CO than the model running on gasoline

The LPG car emits in average 97% less CO than the model running on gasoline

The LPG car emissions are always below Euro 6 limits

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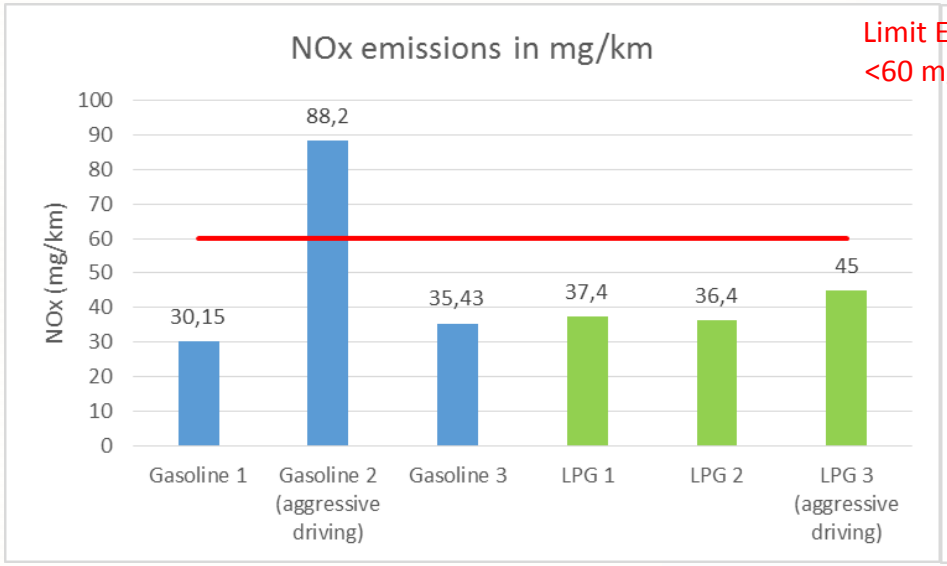
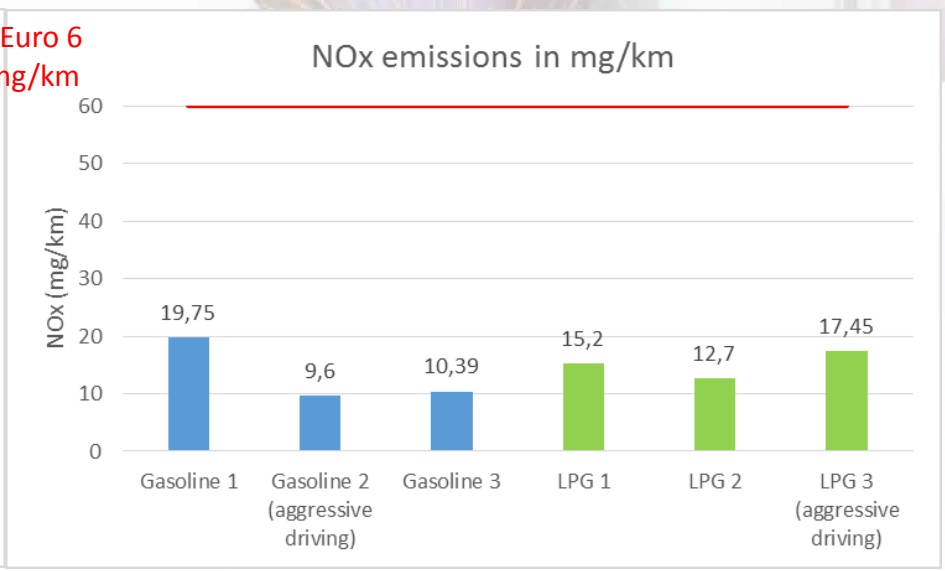
Nitrogen Oxides (NOx) emission results

Mito



Limit Euro 6
<60 mg/km

Fiat 500L



The LPG car emissions are below Euro 6 limits

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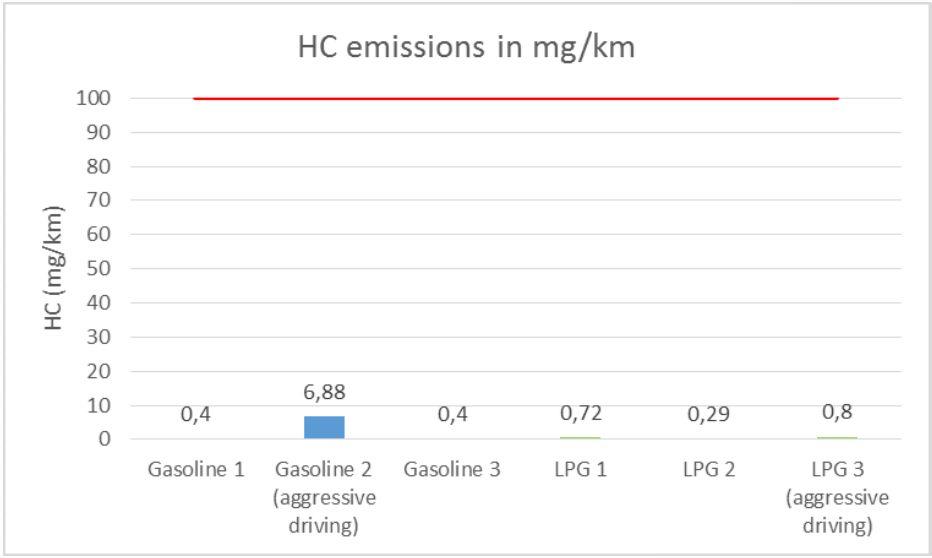
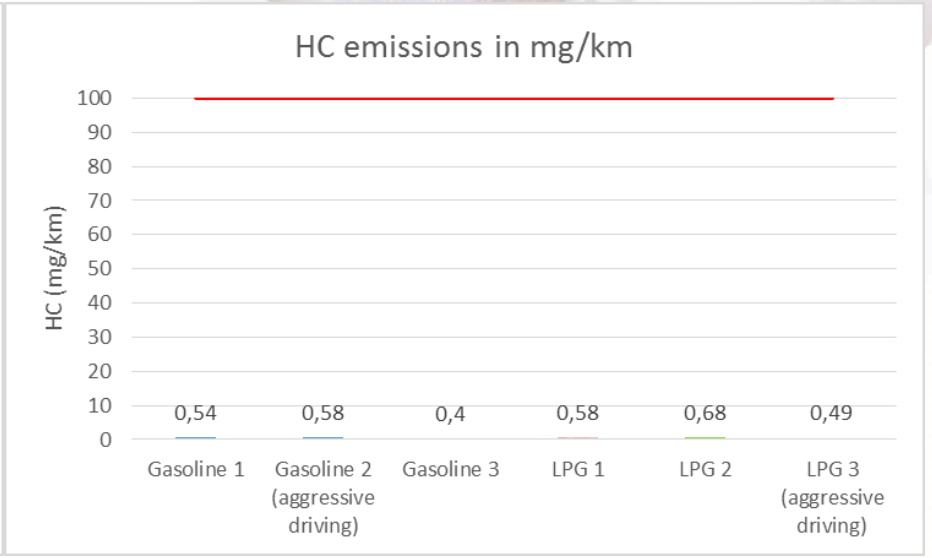
Hydrocarbon (HC) emissions results

Mito

Limit Euro 6
<100 mg/km



Fiat 500L



The LPG car emissions are far below Euro 6 limits in all tests

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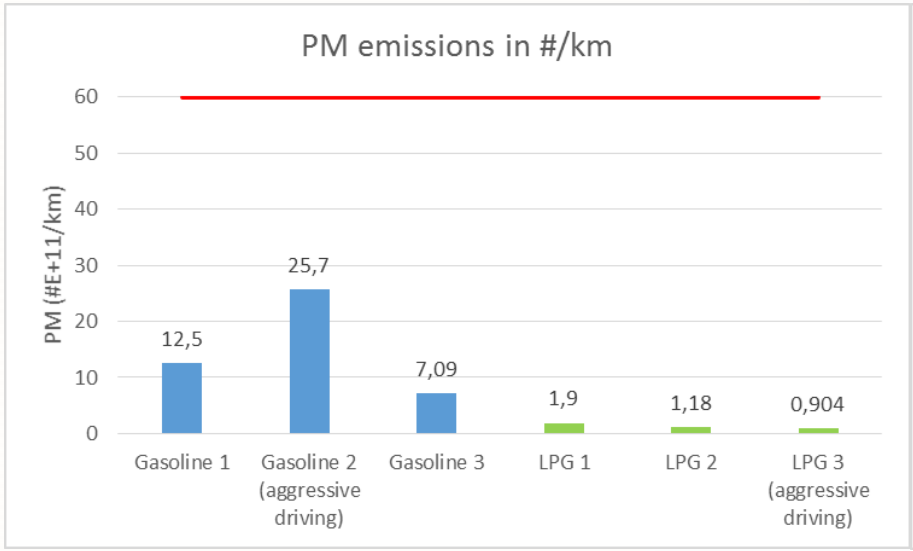
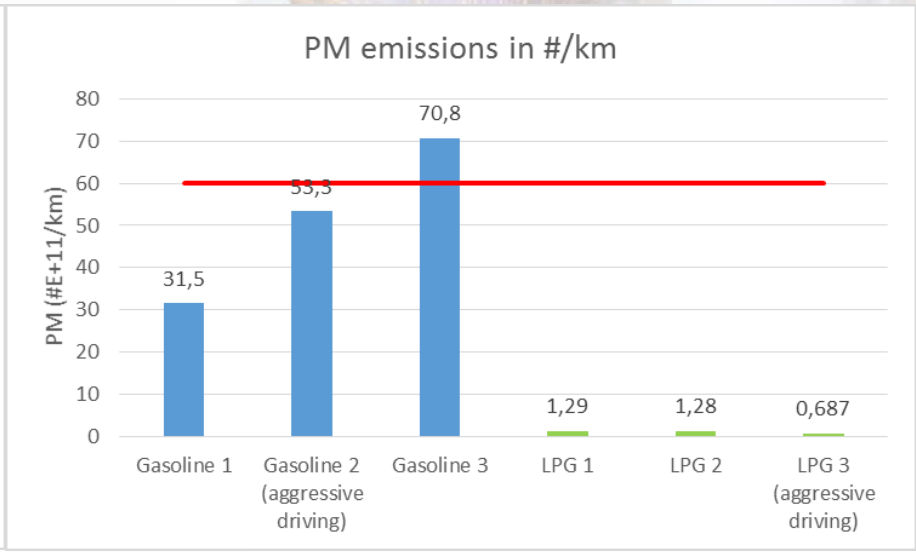
Particulate number (PN) emissions results

Mito

Fiat 500L

Limit Euro 6
<6x10^{12}#/km





The LPG car emissions are far below Euro 6 limits in all tests
The LPG car emits in average 96% less PM than the model running on gasoline

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Conclusions

- Contrary to gasoline, real driving emissions from LPG vehicles, including from the older converted car, are below the limits set out by the Euro 6 standard for all pollutants, even in the case of aggressive driving
- CO2, CO and PN emissions from LPG vehicles are significantly reduced compared to the emissions of the same vehicle running on gasoline
- NOx and HC emissions are similar to petrol, but respectively -54% and -99% than Euro 6 limits

Key results for the autogas fueled vehicles compared to gasoline				
CO2	CO	NOx	HC	PN
-17 to -19%	-60 to -97%	similar	similar	-96%

- To put things in perspective, extrapolating data from a ICCT study on diesel vehicles, we calculated that LPG vehicles emit in average -93% NOx and -76% CO compared to diesel vehicles in similar real-driving conditions
- Autogas has a key role to play in reducing transport emissions

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